



December 9, 2003

Mr. Peter Douglas
Executive Director
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, California 94105-2219

Re: Public health issues related to toxic landfill gases at the Old Mission Bay Landfill and adjacent property being developed for The Journey to Atlantis ride at SeaWorld

Dear Mr. Douglas:

Due to my unique work experience with the Old Mission Bay Landfill in the late 1980's, I have been retained by SeaWorld, Inc. to provide comments on the public health implications of the potential exposure to Hydrogen Sulfide and other toxic landfill gases impacting the Journey to Atlantis ride (JTA).

Currently, I am an independent environmental and hazardous materials consultant specializing in environmental health/hazardous materials training and hazardous chemical emergency response. I hold bachelors and masters degrees in environmental biology, occupational and environmental health, and a California secondary teaching credential. I am also a California Registered Environmental Health Specialist (REHS) and a California Certified Hazardous Materials Specialist. I am an adjunct instructor for the University of California San Diego in their Sciences and Engineering Extension Program. I have worked in the environmental field as a practicing industrial hygienist, environmental health and hazardous materials specialist for 30 years. Until my retirement in March of 2003, I managed the County of San Diego's Chemical Emergency Response Unit in the Hazardous Materials Division of the Department of Environmental Health. I was responsible for the unit's Hazardous Incident Response Team (HIRT) and was an emergency planner for the department and the County. I coordinated HIRT and other emergency planning responsibilities with fire, law enforcement and other environmental regulatory agencies on the local, state and federal levels.

During my tenure with the County of San Diego, my principal responsibility was to perform hazardous chemical identification assessments and public health risk appraisals mostly during emergency situations. I have been the principal investigator conducting public health risk assessments on at least 5,000 chemical release investigations throughout San Diego County in the last 25 years.

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I have reviewed the environmental studies and interested parties' comments/responses resulting from construction of the JTA ride. My comments focus on the potential public health risks associated with Hydrogen Sulfide and other toxic landfill gases that may be present in the hydraulic fill at the Old Mission Bay Landfill (OMBL), SeaWorld's JTA ride, and the adjacent parking area.

Most of the opponent's correspondence suggests that toxic gases which may be present in the landfill, are increasing the public's exposure risk during the Journey to Atlantis ride. This conclusion is principally based on the discovery of H₂S in one well (J-24, IT, January 2002) and the exposure to construction workers excavating a boat-launching ramp in 1988.

Overview

The presence of an elevated concentration of H₂S, in this case discovered 15 feet below the surface in only *one* soil vapor sampling well out of a total of 28, does not by itself constitute any existing or potential public health problem. The key issue for the JTA project is *not* the hazard characteristics of H₂S, but rather the potential for the public to be **EXPOSED** to the gas through inhalation in concentrations above the acute injury threshold. Additionally, such a release into an open air environment must be continuous to exceed an H₂S concentration above 50 ppmv (parts per million volume), which is high enough to cause irritation based symptoms in the public (OHM/TADS, 1999; Lewis, 1996; Ellenhorn, 1987; Hathaway, 1996; ACGIH, 1992). The ride is more than 300 feet from the only significant subsurface H₂S source, and prevailing wind conditions generally exceed 4 mph. The JTA site is upwind from this well and the landfill purported to be an additional source of airborne H₂S. Significant dilution of any air-borne contaminate, especially H₂S, released from this hydraulic fill with limited soil vapor space cannot produce concentrations of gas in ambient air that would affect the general public. Additionally, the ride itself is several stories above ground and is *not* constructed in a confined or unventilated structure where H₂S would concentrate. The environmental history of subsurface toxic gases at the OMBL and the parking area at the JTA construction site supports the conclusion that H₂S will not adversely affect the public. With the exception of the 1988 report of the exposed construction workers grading the landfill and the complaint recently made to the State Department of Toxic Substance Control, *no other complaints or exposures* from toxic gases have been documented in the public record.

Environmental Evaluation/Sampling Reports

If we examine the most recent comprehensive soil vapor sampling record (Soil Vapor Assessment IT- January 2002), the only indication toxic gases are present in concentrations of public health significance (greater than 10 ppmv) is the subsurface results from the **J-24** well sample from that study (1820 ppmv H₂S). This sample was taken with a soil gas vapor probe in a closed system with a hydraulic top cover of fifteen feet, where no ambient air was being introduced. J-24 is located over 300 feet away from the JTA site. This sample was taken in hydraulic fill that was outside of the known boundary of the OMBL. Adjacent soil vapor samples J23–J27 (IT, January 2002, figure 4) and well samples taken by the city do not indicate the presence of H₂S. It is reasonable to conclude that subsurface H₂S concentrations, if present, are quite localized and limited in volume. Limited volumetric concentrations of gaseous H₂S in the soil pores are typically due to the bacterial conversion of organic sulfur containing materials found in the hydraulic top cover (HSDB, 1999). The vapor pressure of H₂S is 1.56×10^4 mmHg (HSDB, 1999). Once released to the surface through disturbances, cracks or excavations in the hydraulic fill top cover, the gas would immediately be

diluted and dissipate in the ambient wind found at the site. Analytical data supporting this outcome is found in the now finalized JTA complaint investigation report conducted by the Department of Toxic Substance Control (DTSC). Ambient air samples were first taken on August 20, 2003 directly above and in the immediate area surrounding the J-24 (IT, January 2002) vapor well site and the JTA construction site. Air monitoring was conducted using direct reading air monitoring instruments (TMX 412 and Passport Five Star) specifically designed to sample for combustible vapors and Hydrogen Sulfide in air. Additionally, ambient air-breathing zone samples were taken on August 21, 2003 using five six-liter stainless steel Summa canisters. Sample locations were placed on the J-24 (IT, January 2002) soil well and at 6 feet intervals north, south, east and west of the well. Air samples captured in the Summa canisters were taken to an approved analytical laboratory and analyzed for H₂S. DTSC responded in their letter to the complainant dated November 26, 2003 that “the air monitoring results of August 20, 2003 indicated no detectable levels of hydrogen sulfide gas.” “Furthermore, there were no variations in the normal oxygen readings that would imply other gases were present. The five air samples analyzed at a state-certified laboratory were non-detect for either reduced hydrogen sulfide compounds or methane gases (DTSC letter to John Wilks and Scott Andrews, November 26, 2003).”

Sabrina Venskus, Attorney at Law, (letter dated September 9, 2003 Section II) states “Table Two [IT Soil Vapor Study, 2002] shows that shallow tests (taken at 5 foot depths) in various wells contained a distinguishing sulfur odor, indicating the presence of H₂S gas throughout the Study area.” The top cover of the OMBL, as well as the clean hydraulic fill covering most of Mission Bay, originated from dried sewage sludge or other materials high in organic materials that contain sulfur compounds produced by bacterial decomposition. It is quite common to encounter a musty odor or the smell of organic decay in these sediments once opened to the atmosphere, but such smells do not automatically indicate the presence of toxic substances, including Hydrogen Sulfide. Equating these types of odors with an H₂S exposure concentrated enough to create a public health problem is unsupported by the historical record at Mission Bay. Additionally, the odor threshold of H₂S in air is 0.02ppb - 0.13ppm (Budavari, 1996; HSDB, 1999), with a characteristic rotten egg smell. This concentration is approximately 750-5000 times *below* the Immediate Dangerous to Life and Health Value (IDLH), which would cause injury or death from H₂S.

Engineering and Construction Controls

The Local Enforcement Agency (LEA), in accordance with Title 27, has required SeaWorld to install a variety of engineering controls and monitoring equipment to detect and manage combustible gas inside buildings on the JTA site. Ventilation of enclosed spaces will be managed with HVAC systems that are designed to control the buildup of landfill gases in any below grade JTA structures. Combustible/Hydrogen Sulfide gas monitors with visual and audible alarms will be installed to continuously monitor all buildings where those gases might intrude. All alarms above safety thresholds must be immediately reported to the LEA. Construction safeguards include high-density concrete structures with waterstop cold joints and Volclay waterproofing panels beneath the slab foundations and subgrade walls to prevent water intrusion and retard landfill gas (Post Closure Land Use Plan for the JTA; Section 1.4.3-1.4.6). As an additional precaution, the LEA for the City of San Diego has required the installation of three monitoring wells strategically located between the boundary of JTA and the Old Mission Bay Landfill. These wells will be used to detect any sub-surface H₂S that potentially could migrate onto the JTA site and act as an early warning system for the ride operators. In my opinion the engineering, administrative, and environmental monitoring

controls required by the LEA are substantially more than adequate and will ensure that no public exposure to toxic landfill gases will occur.

Old Mission Bay Landfill ~ Worker Exposure Response

In October of 1988, I was the supervisor in charge of the field response and subsequent investigation conducted for the reported Hydrogen Sulfide exposure to the construction workers (HIRT report, 1988-478). I was on scene and took many of the direct reading air monitoring measurements to identify the potential air contaminants the injured workers were potentially exposed to while excavating the top cover of the landfill. The Environmental Health HIRT unit was on scene within 30+ minutes of the exposure complaint, which was received by HIRT dispatch from officials at the hospital who treated the exposed workers. It should be noted that at the time of the on scene field investigation, air sampling was conducted in the graded pit and directly over the points where surface grading into the landfill cover was made by the operator of the tractor. At that point no evidence of trash was indicated and the soil appeared to consist of the hydraulic fill typical of the area. Air sampling was conducted using direct reading air monitoring instrumentation which included a United Technologies Hydrogen Sulfide meter with a detection limit of +/- 1ppmv, a Tegal Scientific Photoionization Detector, and a Dräger colorimetric indicator pump with detector tubes specific for low concentrations of Hydrogen Sulfide. Samples were taken in air directly above the area of concern and from soil placed in a plastic bag directly removed from the cuts and pit made by the tractor. Results were non-detect for Hydrogen Sulfide in all the air monitoring samples taken that day. The distinct odor of sulfur also was not present at the time of the sampling in any of the graded sediments. *The claim that the driver of the tractor had died several weeks later from acute Hydrogen Sulfide poisoning has no basis in fact.* The death certificate indicates that natural causes unrelated to landfill gases were responsible for that individual's death. At the time, I was told by his employer that he had a heart attack. Further, examination of the complaint history of the Old Mission Bay Landfill received by the County of San Diego Department of Environmental Health covering the past 20+ years, will show no record of Hydrogen Sulfide exposures other than the initial complaint on October 6, 1988. The complaint records extend back to 1981.

Conclusion

A review of the existing analytical studies, soil vapor assessments, post closure use plans, and the JTA engineering construction requirements in Title 27 regulations, clearly indicates that toxic gases at the Journey to Atlantis site have not and will not present a public health problem. Review of the historical complaint and emergency release reports, dating back to 1983 and available from public regulatory agencies, also confirms that toxic gases have not been a problem for anyone at the Old Mission Bay Landfill. Recent ambient air monitoring conducted by the Cal/EPA Department of Toxic Substance Control also establishes that H₂S is not present at the Journey to Atlantis ride construction site. Additionally, the supposition that H₂S or other toxic gases were the cause of death for a construction worker grading the landfill in 1988 is pure speculation and is not supported by any facts ascertained at the time of the exposure. Based on available data and the proposed engineering and administrative safeguards for H₂S and Methane designed for the JTA ride, revocation of the

construction permit, in my professional opinion, is wholly unjustified and is not supported by the scientific or public health record.

Respectfully,



Michael Handman, M.S., R.E.H.S.
MH Hazmat Services

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